

## (12) UK Patent Application (19) GB (11) 2 184 487 (13) A

(43) Application published 24 Jun 1987

(21) Application No 8630801

(22) Date of filing 23 Dec 1986

(30) Priority data

(31) 3545939

(32) 23 Dec 1985

(33) DE

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F02D 11/04(52) Domestic classification (Edition I)  
F1B B100 B214 BC

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(58) Field of search

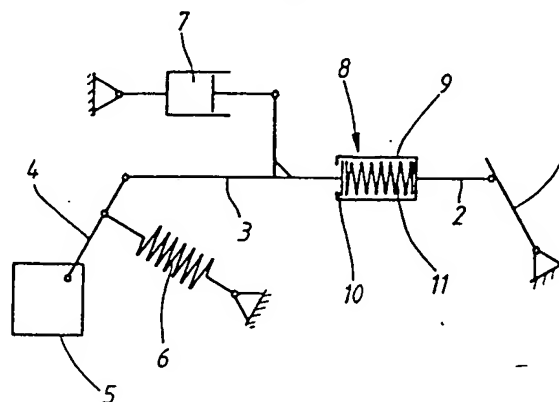
F1B

Selected US specifications from IPC sub-class F02D

(54) Accelerator mechanism for a motor  
vehicle i.c. engine

(57) The transmission between the accelerator pedal 1 and the power output control, e.g. an injection pump control lever 4, includes a damper 7 and a preloaded spring 11 which is compressed when the pedal is depressed rapidly but provides a rigid connection when the pedal is depressed slowly.

Fig. 1



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Fig. 1

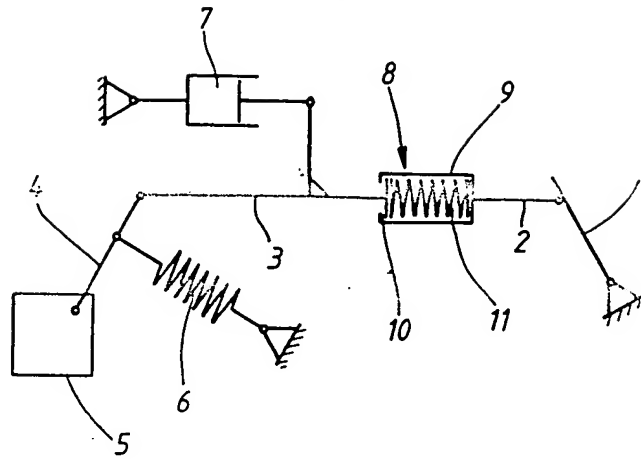
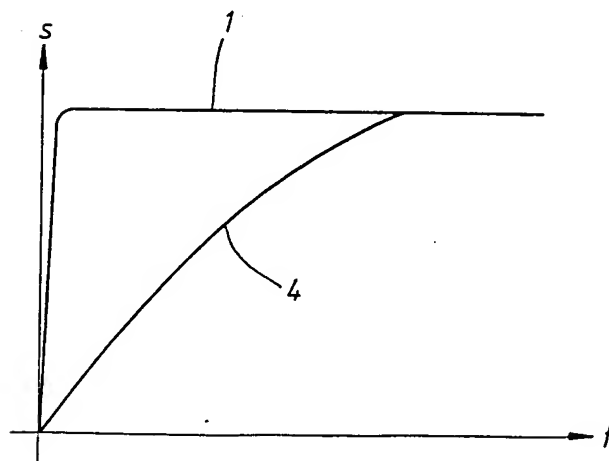


Fig. 2



## SPECIFICATION

### Device for regulating an internal combustion engine in a motor vehicle

The invention relates to a device for regulating an internal combustion engine, particularly but not exclusively an air compressing internal combustion engine, in a motor vehicle, comprising a means of transmitting a regulating movement between an accelerator pedal and a power output stage, such as a control rod of an injection pump, a spring which is inserted in the transmitting means and a damper which engages on the transmitting means between the spring and power output stage and which exerts a resistance to counteract an actuating movement of the device in the full-load direction.

A device of this type is known and is used in standard production vehicles. With this device the movement of the power actuator is intended to be independent of the movement of the accelerator pedal in order to prevent too rapid adjustment of the power actuator and the rapid increase in torque in the internal combustion engine produced as a result of this adjustment, which increased torque can cause unpleasant and dangerous longitudinal oscillations during travel in which the vehicle mass vibrates against the rotating mass of the engine by way of the elasticity and backlash of the drive train.

In the known device the spring consists of rubber-elastic elements which are not compatible with the damper. By means of a rapid and vigorous operation of the accelerator, however, the effect of the damper can be largely eliminated because of the restricted spring deflection of the rubber-elastic elements so that a rapid adjustment of the power actuator is possible, together with its negative consequences.

On the other hand, the rubber-elastic elements are also flexible in the event of slow operation of the accelerator pedal when there is no danger of longitudinal oscillations being caused during travel so that the relation between the accelerator position and power actuator position is undetermined and not precisely recognisable to the vehicle driver.

The present invention seeks to provide an engine regulating device able to operate in such a manner that a slow movement by the power actuator which prevents longitudinal oscillations during travel is ensured by rapid operation of the accelerator, and a rigid coupling between the accelerator and power actuator is ensured upon slow operation of the accelerator which is less critical for causing longitudinal oscillations.

According to the invention, there is provided a device for regulating an internal combustion engine in a motor vehicle, comprising a means of transmitting a regulating movement between an accelerator pedal and a power output stage, such as a control rod of an injection pump, a spring which is inserted in the transmitting means and a damper which engages on the transmitting means between the spring and power output stage and which exerts a resistance to counteract an actuating movement of the device in the full-load direction, wherein the

spring is pretensioned in a spring element against a stop, and the degree of pretensioning of the spring is such that it is excessively compressible when the accelerator pedal is operated rapidly or abruptly, the spring element acting as a rigid connection when the accelerator pedal is operated slowly.

In the device designed in accordance with the invention the damping force which is generated in the damper upon slow, less critical operation of the accelerator is so small that the pretensioning of the spring is not overcome so that the spring element acts as a rigid transmitting element and the position of the power actuator always corresponds to the position of the accelerator pedal. On the other hand, when the accelerator pedal is operated rapidly or abruptly, the damping force of the damper is greater than the spring pretensioning so that the spring is compressed and only then, within a specified period of time, moves the power actuator slowly to counter the resistance of the damper into a position which corresponds to the position of the accelerator pedal.

An embodiment of the invention will now be described by way of an example and with reference to the accompanying drawings, in which:-

Figure 1 shows the device according to the invention in side view, and

Figure 2 shows, in graphical form, a diagram of the time dependence of the regulating distance of the power actuator on the regulating distance of the accelerator pedal.

As shown diagrammatically in Figure 1, a floating lever 4 of an injection pump 5 connecting to an internal combustion engine (not shown in further detail), acting as a transmitting means, is operated by an accelerator pedal 1 via rods 2, 3; the position of a control rod which is connected to the floating lever 4 and acts as the power actuator in this injection pump determining the quantity of fuel injected. A conventional return spring 6 engages on the floating lever 4 and engaging on the rod 3 is a fluid damper 7 which offers a resistance, dependent on the regulating speed to a regulating movement of the floating lever 4 in the full-load direction.

A spring element 8 consisting of a spring 11 pretensioned against a stop 10 in a housing 9 is fitted between the rods 2 and 3. The spring 11 is connected to the floating lever 4 via the rod 3 and the housing 9 is connected to the accelerator pedal via the rod 2.

The pretensioning and spring characteristic of the spring 11 and the damping characteristic of the damper 7 are determined in such a way that - taking the spring characteristic of the return spring 6 into account - the damping force of the damper 7 is less than the pretensioning of the spring 11 when the accelerator pedal 1 is operated slowly. In this case the spring 11 is not compressed, and the spring element 8 acts as a rigid element so that the accelerator pedal 1 and floating lever 4 are adjusted uniformly. The vehicle driver is informed at all times about the position of the power actuator.

Upon rapid operation of the accelerator pedal 1 when there is a danger of longitudinal oscillations being caused during travel, the damping force of the damper 7 is greater than the pretensioning of the spring 11 so that the latter is compressed and the

floating lever 4 has a lower regulating speed than the accelerator 1. In the subsequent period of time the floating lever 4 is adjusted slowly by the tension release in the spring 11 until the spring 11 bears  
5 against the stop 10 and consequently the accelerator 1 and floating lever 4 again occupy the same positions. In this case the adjustment of the floating lever 4 is separate from the regulating movement of the accelerator pedal 1 and only dependent on the  
10 spring 11 and damper 7 whereby a slow adjustment of the floating lever 4 is ensured even when the accelerator pedal 1 is operated rapidly.

The described processes are shown in the diagram in Figure 2 in which the regulating distances of the  
15 accelerator pedal 1 and floating lever 4 is plotted against time  $t$ .

Following abrupt operation of the accelerator pedal 1 the floating lever 4 reaches the position corresponding to the position of the accelerator 1  
20 after a specific period of time and at a relatively low regulating speed. This period is advantageously of the order of approximately half a second.

#### CLAIMS

25 1. A device for regulating an internal combustion engine in a motor vehicle, comprising a means of transmitting a regulating movement between an accelerator pedal and a power output stage, such as  
30 a control rod of an injection pump, a spring which is inserted in the transmitting means and a damper which engages on the transmitting means between the spring and power output stage and which exerts a resistance to counteract an actuating movement of  
35 the device in the full-load direction, wherein the spring is pretensioned in a spring element against a stop, and the degree of pretensioning of the spring is such that it is excessively compressible when the accelerator pedal is operated rapidly or abruptly, the  
40 spring element acting as a rigid connection when the accelerator pedal is operated slowly.

2. A device for regulating an internal combustion engine, substantially as hereinbefore described and with reference to the accompanying drawings.

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